IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application of

Applicant : Paul D. Shirley
Serial No. : 10/773,968
Filed : February 6, 2004
Title : **DEVICE AND METHOD FOR FORMING AN IMPROVED RESIST LAYER**
Docket : MIO 0112 PA/40509.272
Examiner : Laura Edwards
Art Unit: 1792
Confirm. No.: 7341

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Commissioner for Patents
P.O. Box 1450
Mail Stop Appeal Brief - Patents
Alexandria, Virginia 22313-1450

Sir:

APPEAL BRIEF

This is an appeal from the Advisory Action mailed July 16, 2009, wherein the Examiner maintained the finality of her final rejection that was mailed on May 12, 2009. A Notice of Appeal was timely filed on August 11, 2009. Our credit card payment in the amount of $540.00 accompanies this Brief, per 37 CFR §41.20(b)(2).

Real Party In Interest

The real party in interest is the Assignee Micron Technology, Inc., a corporation of the State of Idaho, by assignments from the named inventor, which assignments have been recorded at the United States Patent & Trademark Office on May 17, 2004 at Reel 015336, Frame 0833.

Related Appeals and Interferences

None.

Status of Claims

Claims 1 through 20 stand rejected in the present application and are the subject of the present appeal. Claims 21 through 37 were withdrawn pursuant to a restriction requirement mailed on October 25, 2007.

In a response filed on July 13, 2009, the Applicants amended some of the independent claims to more particularly recite the localized nature of how the control fluid is applied to control resist layer deposition thickness uniformity. The Examiner indicated in her July 23, 2009 Advisory Action that these amendments would not be entered on the ground that they would raise new issues that would require additional consideration, search or both notwithstanding the Applicants' repeated and clear indication of the localized nature of the control fluid deposition. The Appendix includes latest version of the claims in their as-entered form (specifically, as they existed at the time of the May 12, 2009 Office Action), as well as those that were not entered by the Examiner. In the event that the Board concludes that the claims in their non-entered form are needed in order to positively the patentably distinguishing features argued herein, the Applicants are prepared to have such claims entered. Otherwise, the as-entered are believed to be sufficient in and of themselves to support the arguments made below.

Status of Amendments

With the exception of the amendments discussed in the previous section that were made in the Applicants' after-final response mailed on July 13, 2009, all previous amendments have been entered. The Appellants have not filed any response or amendment subsequent to the July 16, 2009 Advisory Action.

Summary of the Claimed Subject Matter

Claims 1, 5, 14, 16 and 20 are the independent claims, each of which recite a device for producing a substantially planar layer of resist that is used in the manufacture of semiconductor devices. A concise explanation of the subject matter defined in the independent claims is set forth for each *in seriatim.*

Independent Claim 1

In independent claim 1, a device **1** for depositing resist onto a substrates **6** includes a rotatable substrate support **40** with a first surface **W** for placement of the resist. The device **1** also includes a resist dispenser **30**, control fluid supply **80** and a controller **110**, where the first of these is situated fluidly adjacent the surface **W**, while the second introduces a control fluid onto the resist to produce a localized change in deposited resist evaporation rate. The controller **110** can be used to control operation of equipment used to deposit the control fluid. Operation of the device **1** promotes uniform resist layer thickness when deposited onto the substrate.

Independent Claim 5

Independent claim 5 recites a device **1** for depositing a solution on a substrate. The device includes a rotatable substrate support **40** with a first surface **W** onto which a layer of solvent-containing solution may be deposited. The device **1** also includes a solution dispenser **30** fluidly

adjacent the first surface **W** for depositing the layer. In addition, the device **1** includes a fluid supply **80** to place a control fluid onto a localized portion of the deposited layer such that the gaseous control fluid produces a local change in evaporation rate of the deposited layer. The device **1** also includes a controller **110** to control operation of equipment used to deposit the control fluid. The controller **110** includes one or more detectors **75**, **85** and **95** to sense a parameter corresponding to the gaseous control fluid, and further includes a feedback apparatus **120** responsive to the one or more detectors **75**, **85** and **95** such that upon a deviation between the sensed parameter and a predetermined reference, the controller **110** adjusts the fluid supply to reduce the deviation.

Independent Claim 14

Independent claim 14 recites a device **1** for depositing a solvent-containing solution on a substrate. The device **1** includes a rotatable wafer chuck **40** with a first surface **W** onto which a layer of solution may be deposited. The device **1** also includes a solution dispenser **30** fluidly adjacent the first surface for depositing the layer. The device **1** also includes a housing **10** disposed about the wafer chuck such that a substantially controllable environment is formed within the housing **10**. The device **1** also includes a fluid supply **80** in fluid communication with the controllable environment, as well a controller **110** with one or more detectors **5**, **85** and **95** and a feedback apparatus **120** to assist in operation of the controller **110**.

Independent Claim 16

Independent claim 16 recites a resist application device **1**. The device **1** includes a rotatable wafer chuck **40**, a resist dispenser **30**, a housing **10**, a fluid supply **80** and a controller **110**. The wafer chuck **40** includes a first surface **W** onto which a layer of solvent-containing resist may be deposited, while the dispenser **30** deposits the resist layer onto the first surface **W**. The housing **10** provides a substantially controllable environment for the deposition of the resist layer, while the fluid supply **80**, through the introduction of a substantially solvent-free gaseous control fluid, can effect a local change in evaporation rate of the layer and concomitant avoidance of resist layer undulations,

thickness variations or related problems. The controller **110** allows the placement of the gaseous control fluid to be varied.

Independent Claim 20

Independent claim 20 recites a resist application device **1**. The device **1** includes a wafer chuck **40**, a resist dispenser **30**, a housing **10**, an airflow supply **80** and a controller **110**. The wafer chuck **40** includes a first surface **W** onto which a layer of solvent-containing resist may be deposited, while the dispenser **30** deposits the resist layer onto the first surface **W**. The housing **10** provides a substantially controllable environment for the deposition of the resist layer, while the airflow supply **80** causes air to impinge onto a desired part of the deposited layer to cause a localized change in evaporation rate of the deposited layer relative to parts of the layer that are not substantially exposed to the impingement. Controller **110** is used to vary the placement of the airflow onto the deposited layer-to effect a substantially uniform thickness of the deposited resist layer.

Grounds of Rejection to be Reviewed on Appeal

Claims 1, 2, 16 and 18 through 20 stand rejected under 35 USC §102(b) as being anticipated by US Patent 5,939,139 to Fujimoto (hereinafter Fujimoto).

Claims 1 through 7, 10, 12 through 18 and 20 rejected under 35 USC §102(b) as being anticipated by US Patent 5,919,520 to Tateyama et al. (hereinafter Tateyama).

Claims 3 and 4 stand rejected under 35 USC §103(a) as being unpatentable over Fujimoto in view of Tateyama.

Claims 8 and 9 stand rejected under 35 USC §103(a) as being unpatentable over Tateyama in view of US Published Application 2002/0176936 to Matsuyama (hereinafter Matsuyama).

Claim 11 stands rejected under 35 USC §103(a) as being unpatentable over Tateyama in view of US Patent 7,077,910 to Chappa et al. (hereinafter Chappa).

Claim 19 stands rejected under 35 USC §103(a) as being unpatentable over Tateyama in view of Fujimoto.

Arguments

I. The rejection of claims 1, 2, 16 and 18 through 20 (claim 1 representative) under 35 USC §102(b) over Fujimoto is improper, as Fujimoto does not teach the claimed device for depositing resist onto a substrate in a localized way as the Examiner suggests.

Independent claim 1 recites, among other things, that the control fluid supply uses a substantially solvent-free gaseous control fluid to provide a *localized* change in a rate of evaporation of the deposited resist. The emphasis on the localized nature of the control fluid impingement is an important feature of the invention, as numerous places in the original specification discuss the value of discrete, targeted application of the gaseous control fluid. A particular example of this is noted beginning at the two lines of page 10 of the original specification, where the Applicant explains that the localized introduction of airflow at discrete locations on the deposited resist layer can be used to (among other things) exert a strong influence on the evaporation rate of the resist in order to avoid the aforementioned problem of thickness variations along the radial dimension of the wafer. Such construction of what it means to be localized within the context of the independent claims is controlled by well-established patent examination practice, where the standard under MPEP 2111 clearly requires not an unmoored "broadest reasonable interpretation" but a broadest reasonable interpretation that is consistent with the specification. Passages such as the one mentioned at the end of page 10 of the original specification are consistent with this clear requirement.

Furthermore, MPEP 2131 states that for a claim to be anticipated, a single reference must disclose each and every positively recited limitation. In other words, a rejection grounded on anticipation is proper only where the subject matter claimed is *identically* disclosed or described in a reference. *In re Arkley*, 172 USPQ 524 (CCPA 1972). Since it is bedrock patent examination practice to consider all words in a claim in judging the patentability of that claim against the prior art (see, e.g., *In re Miller,* 169 USPQ 597, 600 ((CCPA 1971), quoting *In re Wilson,* 165 USPQ 494, 496 (CCPA 1970)), and the system of Fujimoto neither teaches nor suggests a *resist* depositing device or method in a manner as set forth in the claims, it can no longer be relied upon as an anticipatory reference. Specifically, Fujimoto teaches a device and method for removing a coated insulation film *that has been deposited on top of* a resist layer. In fact, aside from the conventional use of wafer spinning, Fujimoto is silent as to improving the planarization of the resist layer, instead focusing on using a combination of solvent and gas to achieve a separate insulation coating layer removal. Because Fujimoto doesn't even address the same type of layer (focusing on polyimides or the like instead of the radiation-sensitive photoresist discussed in the claims), its use as an anticipatory rejection is no longer available.

II. The rejection of claims 1 through 7, 10, 12 through 18 and 20 (claim 1 representative) under 35 USC §102(b) over Tateyama is improper, as Tateyama does not teach the claimed device for depositing resist onto a substrate such that the deposited resist evidences a substantially uniform thickness in the manner that the Examiner suggests.

As stated above in Section I, the claimed device includes a control fluid supply of a substantially solvent-free gaseous control fluid to provide a localized change in a rate of evaporation of the deposited resist. The system of Tateyama neither teaches nor suggests a localized impingement of the control fluid in a manner consistent with the original specification. Specifically, column 8, lines 45 through 52 unequivocally states that the air coming out of nozzle **80** is deposited "along the entire length of moveable beam **20**" and that this configuration can "spout air onto the entire top surface of the wafer". Such a device, with its lengthy discharge configuration, is not capable of the claimed localized performance (as understood by the original specification), as it

cannot operate to provide the desirable variation in control fluid control from the center to the periphery of the wafer. For the Examiner to hold that the discharge of control fluid over the entire length of the beam **20** of Tateyama satisfies the claimed requirement that such fluid discharge be localized would be to destroy the plain meaning of those claim's requirements, and therefore impermissible under MPEP 2111.

III. The rejection of claims 3 and 4 under 35 USC §103(a) as being unpatentable over Fujimoto in view of Tateyama is improper, as neither teaches the claimed localized application of a control fluid to the deposited resist layer of the independent claim from which they depend.

Claims 3 and 4 depend from independent claim 1, which for reasons discussed in Section II above, fails to teach or suggest the localized application of a control fluid to a layer of deposited resist. Because one of the requirements to establish a *prima facie* case of obviousness under MPEP 2143 is that all of the claim limitations must be taught or suggested, and there is nothing in Tateyama to correct the failure of Fujimoto to teach or suggest the localized nature of control fluid discharge onto the deposited resist layer, then at least this component of the tripartite test for obviousness has not been met, and as a logical concomitant, a *prima facie* case for obviousness for these dependent claims can no longer be justified.

An additional requirement under the tripartite test for *prima facie* obviousness is that there must be some motivation to combine the references, as discussed in *In re Geiger,* 2 USPQ2d 1276, 1278 (Fed. Cir. 1987). Regarding this motivation, it has been held that the antithesis of such motivation occurs when the references teach away from the claimed invention, and that such a teaching away is a *per se* demonstration of lack of *prima facie* obviousness. See, e.g., *In re Dow Chemical Co.,* 5 USPQ2d 1529 (Fed. Cir. 1988). While all of the independent claims recite a substantially solvent-free control fluid, Fujimoto is clear that it relies upon a solvent (see, for example, the Abstract, as well as column 1, lines 45 through 49) to achieve coated film removal in a way that is wholly inconsistent with the claimed device. By teaching away from this claimed feature,

one of ordinary skill in the art would not look to combine at least this aspect of Fujimoto with other references. Moreover, because Fujimoto, like all other "prior art reference[s] must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention" (as discussed in MPEP 2142.02), one of ordinary skill in the art would come to the conclusion that the solvent-based approach of Fujimoto is not properly combinable with other references (even were such other references to teach the claimed feature) to sustain the present rejections.

IV. The rejection of claims 8 and 9 under 35 USC §103(a) as being unpatentable over Tateyama in view of Matsuyama is improper, as neither teaches the claimed localized application of a control fluid to the deposited resist layer of the independent claim from which they depend.

Claims 8 and 9 depend from claim 6, which in turn depends from independent claim 5. As discussed in Section II above, Tateyama fails to teach or suggest the claim 5 limitation of a localized application of a control fluid to a layer of deposited resist. For the same reasons discussed above in Section III, the MPEP 2143 requirement that all of the claim limitations must be taught or suggested is not met by the Examiner's proposed combination. As such, the present rejection can no longer be maintained.

V. The rejection of claim 11 under 35 USC §103(a) as being unpatentable over Tateyama in view of Chappa is improper, as neither teaches the claimed localized application of a control fluid to the deposited resist layer of the independent claim from which they depend.

Claim 11 depends from independent claim 5. Chappa does nothing to help Tateyama teach or suggest the localized application of a control fluid to a layer of deposited resist. As such, the MPEP 2143 requirement that all of the claim limitations must be taught or suggested is not met by the Examiner's proposed combination, rendering the present rejection inapplicable to the claims.

VI. The rejection of claim 19 under 35 USC §103(a) as being unpatentable over Tateyama in view of Fujimoto is improper, as neither teaches the claimed localized application of a control fluid to the deposited resist layer of the independent claim from which they depend.

Claim 19 depends from independent claim 16 that recites a rotatable wafer chuck, resist dispenser, housing, control fluid supply and controller. Neither Tateyama nor Fujimoto teach or suggest the localized application of a control fluid to a layer of deposited resist. Because MPEP 2143.03 requires that all of the claim limitations must be taught or suggested, and at least this feature is not met by the Examiner's proposed combination, the present rejection can no longer be maintained. In addition, and for reasons similar to that mentioned in Section IV, since Fujimoto teaches away from the use of a solvent-free control fluid with which to control deposited layer thickness, the Examiner may no longer rely upon it as part of an obviousness rejection where the nature of the control fluid demonstrates solvent-free attributes.

Conclusion

For all of the above reasons, the Applicants submit that the Examiner's rejection of all of the claims is improper, and should be **REVERSED**.

Respectfully submitted,

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Claim Appendix

The first group of claims reflects the claims in their presently entered form. The second group (which starts on page 20) reflects that non-entered claims from the Applicants' July 13, 2009 response.

PRESENTLY ENTERED CLAIMS

1. (Previously Presented) A device for depositing resist onto a substrate, said device comprising:

a rotatable substrate support comprising a first surface onto which a layer of solvent-containing resist may be deposited;

a resist dispenser fluidly adjacent said first surface for depositing said layer on said first surface;

a control fluid supply configured to impart a substantially solvent-free gaseous control fluid onto a portion of said deposited layer such that said gaseous control fluid emanating from said supply effects a local change in evaporation rate of said deposited layer; and

a controller configured to vary the placement of said gaseous control fluid onto said deposited layer of resist to effect a substantially uniform thickness layer thereof.

2. (Original) A device according to claim 1, wherein said control fluid supply comprises a fluid dispensing nozzle that is moveable relative to said rotatable substrate support.

3. (Original) A device according to claim 1, wherein said control fluid supply comprises a plurality of fluid dispensing nozzles.

4. (Original) A device according to claim 3, wherein said plurality of fluid dispensing nozzles occupy a substantially fixed location relative to said rotatable substrate support.

5. (Previously Presented) A device for depositing a solution on a substrate, said device comprising:

a rotatable substrate support comprising a first surface onto which a layer of solvent-containing solution may be deposited;

a solution dispenser fluidly adjacent said first surface for depositing said layer on said first surface;

a fluid supply configured to impart a substantially solvent-free gaseous control fluid onto a portion of said deposited layer such that said gaseous control fluid emanating from said fluid supply effects a local change in evaporation rate of said deposited layer; and

a controller comprising:

at least one detector configured to sense a parameter corresponding to said gaseous control fluid; and

a feedback apparatus responsive to said detector such that upon a deviation between said sensed parameter and a predetermined reference, said controller adjusts said fluid supply to reduce said deviation.

6. (Original) The device of claim 5, wherein said support is a wafer chuck.

7. (Original) The device of claim 6, wherein said fluid supply comprises an airflow supply.

8. (Original) The device of claim 6, further comprising a humidity supply configured to humidify airspace adjacent said wafer chuck.

9. (Original) The device of claim 6, further comprising a temperature supply configured to adjust temperature adjacent said wafer chuck.

10. (Previously Presented) The device of claim 7, wherein said airflow supply is configured to impart airflow onto a predetermined substrate location in a substantially vertically downward direction.

11. (Original) The device of claim 5, wherein said controller is configured to operate in a plurality of modes comprising a substantially automated mode and a manual mode, the second of which permits said controller to be additionally responsive to an operator input.

12. (Previously Presented) The device of claim 5, wherein a dispensing nozzle coupled to said fluid supply is moveable relative to said first surface such that said gaseous control fluid can be imparted onto different said portions of said deposited solution.

13. (Original) The device of claim 12, wherein said dispensing nozzle and said controller are cooperative such that said dispensing nozzle moves in response to said deviation.

14. (Previously Presented) A device for depositing a solvent-containing solution on a substrate, said device comprising:

a rotatable wafer chuck comprising a first surface onto which a layer of solution may be deposited;

a solution dispenser fluidly adjacent said first surface for depositing said layer on said first surface;

a housing disposed about said wafer chuck such that a substantially controllable environment is formed within said housing;

a fluid supply in fluid communication with said substantially controllable environment, said fluid supply configured to impart a substantially solvent-free gaseous control fluid onto a portion of said deposited layer such that said gaseous control fluid emanating from said fluid supply effects a local change in evaporation rate of said deposited layer; and

a controller comprising:

at least one detector configured to sense a parameter corresponding to said gaseous control fluid; and

a feedback apparatus responsive to said detector such that upon a deviation between said sensed parameter and a predetermined reference, said controller adjusts said fluid supply to reduce said deviation.

15. (Original) The device of claim 14, further comprising at least one of an exhaust or drain in said substantially controllable environment.

16. (Previously Presented) A resist application device comprising:

a rotatable wafer chuck comprising a first surface onto which a layer of solvent-containing resist may be deposited;

a dispenser configured to deposit said layer onto said first surface;

a housing disposed about said wafer chuck such that a substantially controllable environment is formed within said housing;

a fluid supply fluidly coupled to said substantially controllable environment, said fluid supply configured to impart a substantially solvent-free gaseous control fluid onto a portion of said deposited layer such that said gaseous control fluid emanating from said fluid supply effects a local change in evaporation rate of said layer; and

a controller configured to vary the placement of said gaseous control fluid onto said deposited layer of resist to effect a substantially uniform thickness layer thereof.

17. (Previously Presented) The device of claim 16, further comprising a detector configured to sense a parameter associated with said gaseous control fluid in said substantially controllable environment such that said controller is responsive to said detector such that upon a deviation

between said sensed parameter and a corresponding predetermined reference level, said controller adjusts said supply to reduce said deviation.

18. (Previously Presented) The device of claim 16, wherein said gaseous control fluid comprises air.

19. (Previously Presented) The device of claim 16, wherein said gaseous control fluid is a substantially inert gas.

20. (Previously Presented) A resist application device comprising:

a rotatable wafer chuck;

a dispenser configured to deposit a solvent-containing layer of resist onto a generally upper surface of said wafer chuck;

a housing disposed about said wafer chuck such that a substantially controllable environment is formed within said housing;

an airflow supply fluidly coupled to said deposited layer on said generally upper surface such that upon impingement of a substantially solvent-free airflow onto a desired part of said deposited layer, said airflow produces a localized change in evaporation rate of said deposited layer relative to parts of said layer that are not substantially exposed to said impingement; and

a controller configured to vary the placement of said airflow onto said deposited layer-to effect a substantially uniform thickness layer thereof.

21. (Withdrawn) A method of controlling the evaporation of solvent from a deposited resist layer, said method comprising:

depositing resist onto a rotating substrate; and

impinging a control fluid onto a portion of said deposited resist prior to curing of said resist such that said control fluid effects a local change in evaporation rate of said deposited resist.

22. (Withdrawn) The method of claim 21, further comprising:

sensing an evaporation parameter corresponding to said control fluid;

determining whether a deviation exists between said sensed parameter and a predetermined reference amount; and

if said deviation exists, adjusting said parameter to reduce said deviation.

23. (Withdrawn) The method of claim 22, wherein said sensed parameter is a flow rate of said control fluid.

24. (Withdrawn) The method of claim 21, wherein said control fluid comprises air.

25. (Withdrawn) The method of claim 21, including placing a housing around said substrate to form a substantially controllable environment.

26. (Withdrawn) The method of claim 25, including controlling temperature within said substantially controllable environment.

27. (Withdrawn) The method of claim 25, including controlling humidity within said substantially controllable environment.

28. (Withdrawn) The method of claim 22, wherein said adjusting comprises selectively increasing or decreasing said control fluid impingement.

29. (Withdrawn) The method of claim 28, wherein said selective increasing or decreasing comprises moving a dispensing nozzle of said supply of control fluid relative to said substrate.

30. (Withdrawn) A method of depositing a resist onto a substrate, said method comprising:

configuring a device to comprise:

a rotatable substrate support comprising a first surface onto which a layer of said resist may be deposited;

a resist dispenser;

a fluid supply configured to impart a control fluid onto a portion of said resist layer such that said control fluid emanating from said fluid supply effects a local change in evaporation rate of said resist layer; and

a controller configured to vary the placement of said control fluid onto said deposited layer of resist to effect a substantially uniform thickness layer thereof;

placing said substrate on said support;

rotating said substrate;

depositing resist from said dispenser onto said substrate to form said resist layer thereon; and

impinging said control fluid onto a portion of said resist layer to effect said local change in said evaporation rate therefrom.

31. (Withdrawn) The method of claim 30, further comprising:

providing at least one detector configured to sense a parameter corresponding to said fluid supply;

sensing said fluid flow parameter with said detector;

comparing said sensed parameter to a predetermined reference to determining whether a deviation exists between said sensed parameter and said predetermined reference; and

if said deviation exists, adjusting said fluid supply to reduce said deviation.

32. (Withdrawn) The method of claim 31, further comprising providing a feedback apparatus responsive to said detector such that said feedback apparatus performs said adjusting said fluid supply.

33. (Withdrawn) The method of claim 31, wherein said substrate is a semiconductor wafer.

34. (Withdrawn) The method of claim 31, wherein said control fluid comprises air.

35. (Withdrawn) A method of forming a resist layer, said method comprising:

configuring a device to comprise:

a rotatable substrate support;

a resist dispenser;

a fluid supply fluidly adjacent said support, said fluid supply configured to impart a control fluid onto a portion of said resist layer such that said control fluid emanating from said fluid supply effects a local change in evaporation rate of said resist layer; and

a controller comprising:

at least one detector configured to sense a fluid flow parameter corresponding to said fluid supply; and

a feedback apparatus responsive to said detector such that upon a deviation between said sensed parameter and a predetermined reference, said controller adjusts said fluid supply to reduce said deviation;

placing said substrate on said support;

rotating said support and substrate;

depositing resist from said dispenser onto said substrate;

sensing said control fluid parameter;

determining whether a deviation exists between said sensed parameter and said predetermined reference;

if said deviation exists, adjusting said supply to reduce said deviation; and

curing at least a portion of said resist.

36. (Withdrawn) The method of claim 35, wherein said resist is cured by:

subjecting said resist to a first heat treatment;

forming a pattern over said resist to define, upon exposure of said pattern to a source of radiation, a first resist portion and a second resist portion;

exposing said pattern and at least one of said resist portions to said source of radiation;

removing one of said first or second resist portions; and

subjecting the portion of the remaining resist portion to a second heat treatment.

37. (Withdrawn) The method of claim 36, wherein said removing comprises removing the resist portion that was not exposed to said source of radiation during said exposing.

NON-ENTERED CLAIMS PROPOSED IN JULY 13 2009 RESPONSE

1. (Currently Amended) A device for depositing resist onto a substrate, said device comprising:

a rotatable substrate support comprising a first surface onto which a layer of solvent-containing resist may be deposited;

a resist dispenser fluidly adjacent said first surface for depositing said layer on said first surface;

a control fluid supply configured to impart a localized flow of substantially solvent-free gaseous control fluid onto a discrete portion of said deposited layer such that said gaseous control fluid emanating from said supply effects a local change in evaporation rate of said deposited layer; and

a controller configured to vary the placement of said gaseous control fluid onto said deposited layer of resist to effect a substantially uniform thickness layer thereof.

2. (Original) A device according to claim 1, wherein said control fluid supply comprises a fluid dispensing nozzle that is moveable relative to said rotatable substrate support.

3. (Original) A device according to claim 1, wherein said control fluid supply comprises a plurality of fluid dispensing nozzles.

4. (Original) A device according to claim 3, wherein said plurality of fluid dispensing nozzles occupy a substantially fixed location relative to said rotatable substrate support.

5. (Currently Amended) A device for depositing a solution on a substrate, said device comprising:

a rotatable substrate support comprising a first surface onto which a layer of solvent-containing solution may be deposited;

a solution dispenser fluidly adjacent said first surface for depositing said layer on said first surface;

a fluid supply configured to impart a localized substantially solvent-free gaseous control fluid onto a discrete portion of said deposited layer such that said gaseous control fluid emanating from said fluid supply effects a local change in evaporation rate of said deposited layer; and

a controller comprising:

at least one detector configured to sense a parameter corresponding to said gaseous control fluid; and

a feedback apparatus responsive to said detector such that upon a deviation between said sensed parameter and a predetermined reference, said controller adjusts said fluid supply to reduce said deviation.

6. (Original) The device of claim 5, wherein said support is a wafer chuck.

7. (Original) The device of claim 6, wherein said fluid supply comprises an airflow supply.

8. (Original) The device of claim 6, further comprising a humidity supply configured to humidify airspace adjacent said wafer chuck.

9. (Original) The device of claim 6, further comprising a temperature supply configured to adjust temperature adjacent said wafer chuck.

10. (Previously Presented) The device of claim 7, wherein said airflow supply is configured to impart airflow onto a predetermined substrate location in a substantially vertically downward direction.

11. (Original) The device of claim 5, wherein said controller is configured to operate in a plurality of modes comprising a substantially automated mode and a manual mode, the second of which permits said controller to be additionally responsive to an operator input.

12. (Previously Presented) The device of claim 5, wherein a dispensing nozzle coupled to said fluid supply is moveable relative to said first surface such that said gaseous control fluid can be imparted onto different said portions of said deposited solution.

13. (Original) The device of claim 12, wherein said dispensing nozzle and said controller are cooperative such that said dispensing nozzle moves in response to said deviation.

14. (Currently Amended) A device for depositing a solvent-containing solution on a substrate, said device comprising:

a rotatable wafer chuck comprising a first surface onto which a layer of solution may be deposited;

a solution dispenser fluidly adjacent said first surface for depositing said layer on said first surface;

a housing disposed about said wafer chuck such that a substantially controllable environment is formed within said housing;

a fluid supply in fluid communication with said substantially controllable environment, said fluid supply configured to impart a localized flow of substantially solvent-free gaseous control fluid onto a discrete portion of said deposited layer such that said gaseous control fluid emanating from said fluid supply effects a local change in evaporation rate of said deposited layer; and

a controller comprising:

at least one detector configured to sense a parameter corresponding to said gaseous control fluid; and

a feedback apparatus responsive to said detector such that upon a deviation between said sensed parameter and a predetermined reference, said controller adjusts said fluid supply to reduce said deviation.

15. (Original) The device of claim 14, further comprising at least one of an exhaust or drain in said substantially controllable environment.

16. (Currently Amended) A resist application device comprising:

a rotatable wafer chuck comprising a first surface onto which a layer of solvent-containing resist may be deposited;

a dispenser configured to deposit said layer onto said first surface;

a housing disposed about said wafer chuck such that a substantially controllable environment is formed within said housing;

a fluid supply fluidly coupled to said substantially controllable environment, said fluid supply configured to impart a localized flow of substantially solvent-free gaseous control fluid onto a discrete portion of said deposited layer such that said gaseous control fluid emanating from said fluid supply effects a local change in evaporation rate of said layer; and

a controller configured to vary the placement of said gaseous control fluid onto said deposited layer of resist to effect a substantially uniform thickness layer thereof.

17. (Previously Presented) The device of claim 16, further comprising a detector configured to sense a parameter associated with said gaseous control fluid in said substantially controllable environment such that said controller is responsive to said detector such that upon a deviation between said sensed parameter and a corresponding predetermined reference level, said controller adjusts said supply to reduce said deviation.

18. (Previously Presented) The device of claim 16, wherein said gaseous control fluid comprises air.

19. (Previously Presented) The device of claim 16, wherein said gaseous control fluid is a substantially inert gas.

20. (Currently Amended) A resist application device comprising:

a rotatable wafer chuck;

a dispenser configured to deposit a solvent-containing layer of resist onto a generally upper surface of said wafer chuck;

a housing disposed about said wafer chuck such that a substantially controllable environment is formed within said housing;

an airflow supply fluidly coupled to said deposited layer on said generally upper surface such that upon impingement of a localized flow of substantially solvent-free airflow onto a desired discrete part of said deposited layer, said airflow produces a localized change in evaporation rate of said deposited layer relative to parts of said layer that are not substantially exposed to said impingement; and

a controller configured to vary the placement of said airflow onto said deposited layer to effect a substantially uniform thickness layer thereof.

21. (Withdrawn) A method of controlling the evaporation of solvent from a deposited resist layer, said method comprising:

depositing resist onto a rotating substrate; and

impinging a control fluid onto a portion of said deposited resist prior to curing of said resist such that said control fluid effects a local change in evaporation rate of said deposited resist.

22. (Withdrawn) The method of claim 21, further comprising:

sensing an evaporation parameter corresponding to said control fluid;

determining whether a deviation exists between said sensed parameter and a predetermined reference amount; and

if said deviation exists, adjusting said parameter to reduce said deviation.

23. (Withdrawn) The method of claim 22, wherein said sensed parameter is a flow rate of said control fluid.

24. (Withdrawn) The method of claim 21, wherein said control fluid comprises air.

25. (Withdrawn) The method of claim 21, including placing a housing around said substrate to form a substantially controllable environment.

26. (Withdrawn) The method of claim 25, including controlling temperature within said substantially controllable environment.

27. (Withdrawn) The method of claim 25, including controlling humidity within said substantially controllable environment.

28. (Withdrawn) The method of claim 22, wherein said adjusting comprises selectively increasing or decreasing said control fluid impingement.

29. (Withdrawn) The method of claim 28, wherein said selective increasing or decreasing comprises moving a dispensing nozzle of said supply of control fluid relative to said substrate.

30. (Withdrawn) A method of depositing a resist onto a substrate, said method comprising:

configuring a device to comprise:

a rotatable substrate support comprising a first surface onto which a layer of said resist may be deposited;

a resist dispenser;

a fluid supply configured to impart a control fluid onto a portion of said resist layer such that said control fluid emanating from said fluid supply effects a local change in evaporation rate of said resist layer; and

a controller configured to vary the placement of said control fluid onto said deposited layer of resist to effect a substantially uniform thickness layer thereof;

placing said substrate on said support;

rotating said substrate;

depositing resist from said dispenser onto said substrate to form said resist layer thereon; and

impinging said control fluid onto a portion of said resist layer to effect said local change in said evaporation rate therefrom.

31. (Withdrawn) The method of claim 30, further comprising:

providing at least one detector configured to sense a parameter corresponding to said fluid supply;

sensing said fluid flow parameter with said detector;

comparing said sensed parameter to a predetermined reference to determining whether a deviation exists between said sensed parameter and said predetermined reference; and

if said deviation exists, adjusting said fluid supply to reduce said deviation.

32. (Withdrawn) The method of claim 31, further comprising providing a feedback apparatus responsive to said detector such that said feedback apparatus performs said adjusting said fluid supply.

33. (Withdrawn) The method of claim 31, wherein said substrate is a semiconductor wafer.

34. (Withdrawn) The method of claim 31, wherein said control fluid comprises air.

35. (Withdrawn) A method of forming a resist layer, said method comprising:

configuring a device to comprise:

a rotatable substrate support;

a resist dispenser;

a fluid supply fluidly adjacent said support, said fluid supply configured to impart a control fluid onto a portion of said resist layer such that said control fluid emanating from said fluid supply effects a local change in evaporation rate of said resist layer; and

a controller comprising:

at least one detector configured to sense a fluid flow parameter corresponding to said fluid supply; and

a feedback apparatus responsive to said detector such that upon a deviation between said sensed parameter and a predetermined reference, said controller adjusts said fluid supply to reduce said deviation;

placing said substrate on said support;

rotating said support and substrate;

depositing resist from said dispenser onto said substrate;

sensing said control fluid parameter;

determining whether a deviation exists between said sensed parameter and said predetermined reference;

if said deviation exists, adjusting said supply to reduce said deviation; and

curing at least a portion of said resist.

36. (Withdrawn) The method of claim 35, wherein said resist is cured by:

subjecting said resist to a first heat treatment;

forming a pattern over said resist to define, upon exposure of said pattern to a source of radiation, a first resist portion and a second resist portion;

exposing said pattern and at least one of said resist portions to said source of radiation;

removing one of said first or second resist portions; and

subjecting the portion of the remaining resist portion to a second heat treatment.

37. (Withdrawn) The method of claim 36, wherein said removing comprises removing the resist portion that was not exposed to said source of radiation during said exposing.

Evidence Appendix

None.

Related Proceedings Appendix

None.